ENERGAIN

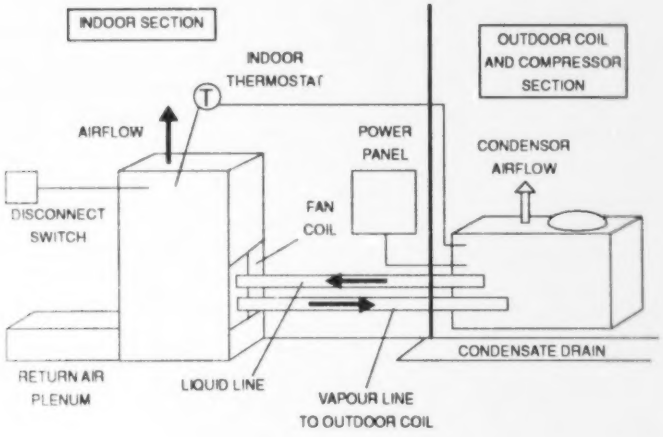
Heat Pumps for Home Heating

A report on the Small Scale Energy Demonstration Program

Heat pumps use a circulating refrigerant to absorb heat from one medium and transfer it to another. An example of a heat pump is found in almost every home - the refrigerator. In this case, the heat from food is taken from the refrigerator and rejected to the kitchen. Heat pumps for residential applications typically absorb heat from outside air, ground water or the ground itself, and transfer it to the inside warm air or hot water heating systems. Heat pumps are more efficient than any other heating system presently available, and the technology is still advancing. One in three new homes in the United States is equipped with a heat pump.

Ground-source heat pumps are rapidly gaining acceptance in other regions of North America, and are reported to provide good savings and short paybacks. They may be more appropriate than air-to-air systems in our generally cooler climate.

Air-to-Air Heat Pump



An air-to-air heat pump absorbs heat from outside air and transfers it to the air inside a building through a warm air heating system. As the outside temperature falls, these heat pumps become less efficient, and a source of supplementary heat is required. This supplementary source is usually an electric duct heater. There is a propane-based supplementary heater heat pump system, the "Kool-Fire", manufactured in Ontario. Typically, no supplementary heat is required until the outside temperature falls below 0°C (32°F).

All the air-to-air heat pumps installed as CREDA retrofits are working properly. The only maintenance reported is yearly cleaning to prevent dust accumulation on coils in the unit. The situation, costs, and benefits of each project are shown in the table below.

OWNER	HOUSE SIZE	AVERAGE YEARLY SAVINGS	SUPPLEMENTARY HEATING	INSTALLATION COST	SIMPLE PAYBACK PERIOD
O,Driscoll	186m^2 (2000 ft^2)	$1500	- - - - -	$5900	3.9 Years
Stanley	126m^2 (1350 ft^2)	650	$350 Wood	3400	5.2 "
Bonia	126m^2 (1350 ft^2)	500	350 "	3900	7.8 "
Winters	279m^2 (3000 ft^2)	1250	250 "	6400	5.1 "

These projects were assisted by the Small Scale Energy Demonstration Program, which was part of CREDA, the Canada/Newfoundland Conservation and Renewable Energy Demonstration Agreement, funded by Energy, Mines and Resources Canada (80%) and the Newfoundland Department of Mines and Energy (20%).

Department of Mines and Energy

Government of Newfoundland and Labrador

Hon. Rex Gibbons, Ph. D., Minister

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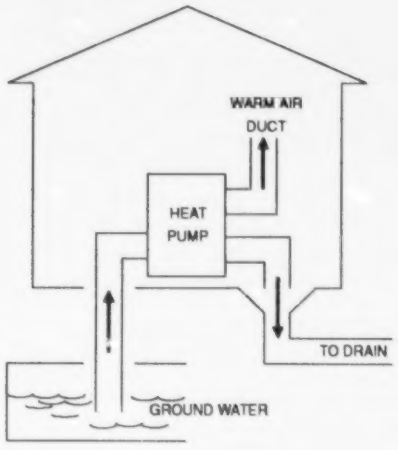
Water-to Air Heat Pump

Water-to-air heat pumps use heat absorbed, in most cases, from a supply of ground water. A water-to-air system used by Robin Shaw in his home in Mount Pearl is very efficient, achieving an estimated annual energy saving of $1100. The cost of putting the system in place was $4800. The simple payback period is 4.4 years. Although Mr. Shaw hasn't reported any maintenance problems, he does complain of noise from the system. Place a heat pump in an appropriately remote or soundproofed area, to minimize noise problems.

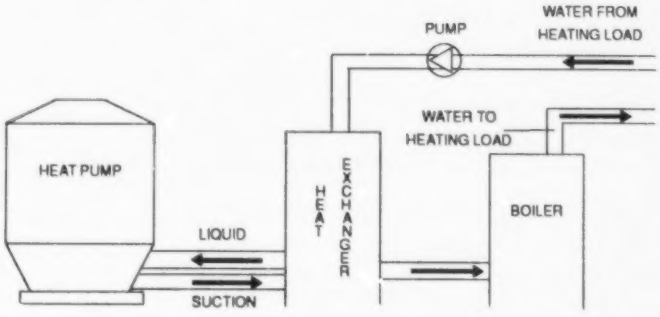
William Newton installed a water-to-air heat pump in his 232 m^2 (2500 ft^2) house. The unit uses the domestic well as its water source. It saved less than half the energy estimated before building, and was eventually turned off due to low water capacity in the well. If the difference in initial costs between baseboard heaters and the heat pump is accounted for, the payback is 7.5 years. If the total initial cost of the heat pump ($4400) is used, the payback is 23 years. This instance illustrates the need for care in specifing a heat pump system.



Air-to-Water Heat Pump

Air-to-water heat pumps operate like air-to-air systems, except that the heat absorbed by the pump is transferred to water. Lawrence Cashin of St. John's chose an air-to-water system to recover excess furnace heat in his basement, which would be used to preheat domestic hot water. Unfortunately, use of the system led to increased space heating costs. The system is now used primarily as a dehumidifier during the summer months.

David Thompson installed a water-to-air heat pump to heat the water for a 185 m^2 (2000 ft^2) house with an oil-fired hot water radiation system. He intended to use an existing oil-fired boiler to provide supplementary heat. Mr. Thompson used the system for three years, then shut it off because of the low cost of home heating oil at that time. Of course, should the cost of oil rise again, the heat pump could be reactivated. The savings were about $1200 per year throughout its operation. The pump cost $5200 to put in place, giving a simple payback of 4.3 years.



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